

CLAIMS

1. Process for forming an optical element by molding at least two polymerizing reactants characterized by the fact that the molded element is obtained by a reaction injection molding process comprising the steps
5 of mixing at least two polymerizing reactants in a mixing chamber (12) for obtaining a reacting mixture, forcing said mixture to flow by an injection duct (5) for filling under pressure a sealed mold cavity (4) having an entry side (43) provided with a casting opening (42) and an evacuation side (44), and providing a laminated flow of mixture in a spout (6) having a
10 progressive enlarging transversal section between an outlet opening (52) of the injection duct (5) and the casting opening (42) of the mold cavity (4), for avoiding any turbulent area in said laminated flow, the evacuation side (44) of said mold cavity (4) being provided with means (45) for evacuating air eventually contained in the mixture during mold filling
15 before solidification of the element.
2. Process according to claim 1 for forming an optical element having a substantially circular shape and a substantially regular transversal thickness wherein the sealed mold cavity (4) has a substantially circular shape and a transversal thickness corresponding to those of the element and wherein the spout (6) provides a substantially flat space (60) having an axis (x'x) substantially passing by the center of the mold cavity (4) and being limited by two flat faces (61, 61') and two diverging sides (62, 62') inclined on either side of said axis (x'x) and tangentially connecting to the circular shape (45) of the mold cavity (4),
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- 25 3. Process according to claim 2 wherein the casting opening (42) of the mold cavity (4) largely opens along a sector (A) of the circular shape (45) of the mold cavity (4), said flat faces (61, 61') of the spout (6) each having a substantially trapezoidal shape with a large curvilinear base extending along said sector (A) of the mold cavity (4) and a short base connecting the outlet opening (52) of the injection duct (5).
- 30 4. Process according to one of claims 1 to 3 wherein said mold cavity (4) and said spout (6) are inclined as regards the horizontal, said mold cavity (4) having a lowest entry side and a highest evacuation side.

5. Process according to one of the preceding claims, comprising a compression step of the molded mixture after the mold cavity (4) has been filled completely.

6. Process according to one of the preceding claims comprising
5 the step of trapping a first part of the mixture upwards of the injection flow, in a final part (53) of the injection duct provided between the outlet opening (52) and a closed end (54).

7. Process according to one of the preceding claims, wherein said
10 mold cavity is limited by two plates (31, 31') between which is inserted a circular seal (41) comprising at least a vent (45) for evacuating air during mold filling, the process comprising the steps of exerting an increased clamping force between the plates (31, 31') limiting the mold cavity (4), at the end of mold filling, for compressing the circular seal and closing the vent (45), and then applying a post-injection pressure in the molded
15 mixture.

8. Process according to claim 7, wherein the clamping force compressing the circular seal (41) is increased during curing of the reactants in order to compensate for shrinkage.

9. Process according to one of the preceding claims, comprising
20 the steps of accumulating the evacuated air in a space (73) provided on the evacuation side (44).

10. Process according to one of claims 1 to 8, comprising the steps of evacuating air by an aperture (47) provided on the evacuation side (44) of the mold cavity (4) and closing said aperture (47) when said
25 mold cavity (4) is completely filled by the injected mixture.

11. Molding installation for forming an optical lens (2) having a substantially circular shape and a substantially regular transversal thickness, said installation comprising:

- a mixing chamber (12) for preparing a mixture to be molded,
- 30 - a sealed mold cavity (4) with a substantially circular shape having a center and a transversal thickness corresponding to those of the lens to be obtained, said mold cavity (4) being limited by two plates (31, 31') between which is inserted an elongated seal, and having an entry side (43) provided with a casting

opening (42) and an evacuation side (44) opposite to said entry side (43),

- an injection duct (5) connecting said mixing chamber (12) to said mold cavity (4), said injection duct having an outlet opening (52),
 - 5 - a spout (6) connecting said outlet opening (52') of the injection duct (5) to the casting opening of the mold cavity (4),
 - filling means (14) for forcing said mixture to flow from the mixing chamber (12) to the mold cavity (4) via said injection duct (5) and said spout (6) for filling said mold cavity (4) under pressure,
- 10 - at least a vent (45) provided on said evacuation side (44) of the mold cavity (4) and connected to air evacuation means (7),
 - said spout (6) providing a substantially flat space (60) having an axis (x'x) substantially passing by the center of the mold cavity (4) and being limited by two flat faces (61, 61') and two diverging sides (62, 62') inclined on either side of said axis (x'x) and tangentially connecting to the circular shape (45) of the mold cavity (4).
- 15 12. Molding installation according to claim 11, wherein the injection duct is prolonged by a part (53) extending in the flow direction from the outlet opening (52) until a closed end (54), said part (53) forming a reserve for trapping a first part of the mixture flowing upwards in said injection duct (5).
- 20 13. Molding installation according to one of claims 11 and 12, wherein each vent (45) provided on the evacuation side (44) of the mold cavity (4) is constituted by at least an aperture which is small enough to avoid reactants contained in the mixture to flow outside.
- 25 14. Molding installation according to one of claims 11 and 12, wherein each vent (45) provided on the evacuation side of the mold cavity (4) is closed by a removable valve (7), said valve (7) being open during mold filling and being closed after air evacuation for applying a post-injection pressure in said mold cavity (4).
- 30 15. Molding installation according to one of claims 11 to 14, comprising a space (73) opening on the evacuation side (44) of the mold cavity (4) for trapping air contained in the mixture to be molded, said mold cavity (4) and said space (73) being surrounded by a common continuous seal.
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16. Molding installation according to one of claims 11 to 14, wherein each vent comprises an aperture (45) provided in the seal (41) on the evacuation side (44) of the mold cavity (4) and connected with air evacuation means.

5 17. Molding installation according to claim 16, wherein a post-injection pressure is applied in the mold cavity (4) after completely filling and air evacuation, said pressure compressing the seal (41) and closing the vents (45).

10 18. Molding installation according to claim 17, wherein said aperture is closed by a plug (71) having a slight play (72) for allowing air evacuation during filling of the mold cavity (4) by the injected mixture, said plug (71) expanding and closing said play (72) by increasing of its temperature when the mold cavity (4) is completely filled.

15 19. Molding installation according to one of claims 11 to 18, wherein the mold cavity (4) extends along an inclined median plane making an angle different from zero with the horizontal and comprises a lowest part and a highest part respectively constituting the entry side (43) and the evacuation side (44) of said mold cavity (4).

20 20. Molding installation according to claim 19, wherein the flat trapezoidal faces (61, 61') of the enlarging spout (6) are substantially parallel to the median plane (P) of the mold cavity (4).

25 21. Molding installation according to claim 19, wherein the flat trapezoidal faces (61, 61') of the enlarging spout (6) are symmetrically inclined by a slight angle on either side of the median plane (P) of the mold cavity (4), said flat faces slightly converging from the outlet opening (52) of the injection duct (5) to the inlet opening (42) of the mold cavity (4).